Docket #: S19-517

Three-Recombinase-Dependent Viral Expression for Increased Neuron Specificity

Stanford researchers have discovered a method (Triplesect) to express molecular payloads using three-recombinase-dependent viral expression. Triplesect restricts functional expression of molecular tools such as optogenetic tools, CRISPR or therapeutic genes to pre-defined cellular subpopulations. The targeting resolution of this method is achieved through a multiply-engineered approach utilizing Boolean logic to identify targeted neurons or other cells. For example, neurons expressing gene A AND gene B AND gene C, but no other combination are targeted. As a result, this additional recombinase allows researchers to have increased specificity in targeting restricted neuron subpopulations. Additionally, Triplesect's viral delivery mechanism saves 30x the cost per genetic payload when comparing a typical viral batch to a new transgenic mouse.

Stage of Research

- in vivo

Applications

- **Targeting molecular tools**
  - Fluorescent proteins
  - Genetically-encoded calcium indicators
  - Optogenetic tools
  - Synthetic and natural receptors
- **Translational neuroscience research**

Advantages

- **Three levels of targeting resolution via Boolean operators**
- Viral delivery is 30x cheaper per payload vs transgenic mouse models

Publications

- Fenno et al. Neuron (2020) "Comprehensive Dual- and Triple-Feature Intersectional Single-Vector Delivery of Diverse Functional Payloads to Cells of Behaving Mammals"

Patents

- Published Application: WO2021158651
- Published Application: 20230064644

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